Math 117
Practice Problems for Exam 2

1. Evaluate \( \int \int \int_{G} x^2 y \, dV \) where \( G \) is the solid with \(-1 \leq x \leq 3, 0 \leq y \leq 4, \) and \(-2 \leq z \leq 1.\)

2. Find the mass of the lamina with density \( \delta(x, y) = 2x^2 \) that is bounded by \( y = 9 - x^2 \) and \( y = 0.\)

3. (a) Find parametric equations for the line that passes through the points \((2, 7)\) and \((3, 4)\).

(b) An object is moving in a clockwise direction around a circle of radius 3 centered at the origin. The object is at \((3, 0)\) when \( t = 0.\) Find parametric equations to describe the position of the object at time \( t.\)

4. Let \( G \) be a solid and \( f(x, y, z) \) be a function. State the definition of the triple integral \( \iiint_{G} f(x, y, z) \, dV.\) Be sure to explain what the notation in the definition represents.

5. Set up, but do not evaluate, the following iterated integrals.

(a) an iterated integral to find the volume of the solid \( G \) that is bounded by \( y^2 + z^2 = 16, \) \( x = -3, \) and \( x + z = 4.\)

(b) iterated integrals in cylindrical coordinates to find the \( y \)-coordinate of the centroid of the solid that is bounded by \( z = 18 - x^2 - y^2 \) and \( z = x^2 + y^2.\)

(c) an iterated integral in spherical coordinates to evaluate \( \iiint_{G} x^2 \, dV \) where \( G \) is the solid bounded below by \( z = 3 \) and above by \( x^2 + y^2 + z^2 = 36.\)

6. Find the volume of the solid that is bounded below by \( z = \sqrt{3x^2 + 3y^2} \) and above by \( x^2 + y^2 + z^2 = 81.\)

7. Evaluate the iterated integral \( \int_{-3}^{3} \int_{0}^{\sqrt{9-x^2}} \int_{-\sqrt{16-x^2-y^2}}^{\sqrt{16-x^2-y^2}} \, 1 \, dz \, dy \, dx.\)

8. (a) Evaluate the line integral \( \int_{C} y \, dx - 2x \, dy \) where \( C \) is the line segment from \((-1, 0)\) to \((1, 1)\).

(b) A particle moves along the upper half of the circle \( x^2 + y^2 = 4 \) from the point \((2, 0)\) to the point \((0, 2)\). Find the work done by the force field \( \mathbf{F} = 2xy \mathbf{i} - 3 \mathbf{j} \) on the particle.